Minerals for the energy and digital transition in Spain: demand, recycling and demand reduction measures

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Executive summary

Foreword by Amigas de la Tierra

To maintain its economy based on continued growth, the European Union needs to secure the supply of raw materials, including mineral resources essential to its industry. Like other world powers such as the US, the EU is concerned about the expected increase in demand for critical minerals. This demand is linked to energy and digital transition policies that seek to decarbonise our economy without questioning our production and consumption model.

In this context, in March 2023 the European Commission (EC) presented its proposal for a *"European Critical Raw Materials Act"* aimed at ensuring "secure and sustainable supply of critical raw materials for Europe's industry and significantly lower the EU's dependency on imports from single country suppliers". The text was published as part of the "Green Deal Industrial Plan". With this regulatory package, the EC expects to increase European production of "clean energy" and reduce dependence on powers such as China and Russia. Although the proposal for a raw materials law is presented as crucial for the energy and digital transition, its objectives go beyond the decarbonisation of our economy. Through the Green Deal Industrial Plan, the European Union hopes to strengthen its position in a global context marked by a race for resources, geopolitical tensions, rising energy prices and inflation (dynamics accelerated by the pandemic and the war in Ukraine)[1].

At the same time, organisations such as the International Energy Agency have forecast a sharp increase in the demand for critical minerals for the energy and digital transition (along with other sectors such as defence[2] and the aerospace industry). The European Union is aware that it depends on other players, mostly China, to obtain these resources. In this context, the European response, through policies like the aforementioned Critical Raw Materials Act, is focused on three key ideas: increasing mineral

extraction within Europe while expanding and diversifying supply from third countries, streamlining permitting and providing economic support for "strategic" projects, and promoting supply chain circularity. This approach ignores, as critics from various organisations have pointed out[3], the adoption of measures that could reduce or mitigate the demand for minerals and, thus, the need for primary extraction.

At the national level, the Spanish government approved the "Roadmap for the sustainable management of mineral raw materials" in 2022. The document expresses the need to increase domestic mining. However, this roadmap is not based on any specific study of the increase in minerals demand associated with the current ecological transition plans in Spain, nor does it contemplate measures to mitigate or reduce this demand. At the same time, organisations such as Amigas de la Tierra are warning of a new "mining boom" in Spain. These organisations are denouncing the socio-environmental risks and impacts of the extractive industry caused by past mining operations, by ongoing projects and by the new projects that the new laws will promote.

Study

This research aims to address one of the shortcomings identified in the described framework, namely that no specific analysis has been conducted on the mineral demand linked to the Spanish energy and digital transition plans. The potential impact of measures aimed at increasing mineral recovery and demand reduction has also been neglected so far. Such a diagnosis needs to go in parallel to a much-needed reflection: is it possible to achieve a sustainable and socially just ecological transition by simply replacing energy sources, without changing our production and consumption model? We are facing an unprecedented ecosocial crisis. It is essential to move towards an energy transition, but is it possible to do so under the prevailing conditions, within the framework of an economy that does not take into account planetary limits or the well-being of its societies?

This research **analyses the mineral consequences of Spain's energy and digital transition plans up to 2050. It also evaluates the impact that different recycling, circular economy and sufficiency measures could have on reducing demand and primary extraction requirements.** The study focuses on 10 groups of metals: aluminium (Al), copper (Cu), cobalt (Co), lithium (Li), manganese (Mn), nickel (Ni), gold (Au), silver (Ag), PGMs (platinum (Pt) and palladium (Pd)), and rare earths (dysprosium (Dy) and neodymium (Nd)), and looks at six technological spheres related to renewable energy generation, energy storage, electric mobility, and digital technology.

Chapter 1 describes the scope and objectives of the study. *Chapter 2* briefly describes the methodology and calculation model. The research is based on *material flow analysis (MFA)*, which allows us to determine both the demand for metals associated with different technologies and the quantity of metals contained in end-of-life technologies. *Chapter 3* describes the Spanish public policies that form the basis for the minerals demand assessment. It also describes three different scenarios. These scenarios allow us to compare variations in future mineral demand according to whether or not the energy transition involves a decisive boost to recycling and other measures to save mineral resources, for example changing the mobility model by reducing the car fleet and opting for public transport.

Results

Chapter 4 describes the results of the research. These are presented in three steps, showing the results of the technologies that must be manufactured as a consequence of public energy transition policies; the demand for metals arising from these scenarios and the recovery of metals according to the collection and recycling rates considered; and finally, the primary extraction requirements linked to the preceding results. These results are analysed comparatively, examining how materials (technologies, demand, recycling, and primary extraction) increase or decrease according to whether or not the aforementioned circular economy and sufficiency measures are applied.

Some of the **key results** for the period up to 2050 are:

- **Electric mobility dominates the demand for metals,** accounting for 54-58% of the cumulative demand for aluminium and copper; 73-92% of manganese, cobalt, nickel and lithium; and 79% of dysprosium and neodymium in 2020-2050. In the specific case of palladium and platinum, the main demand driver is the manufacture of electrolysers for **green hydrogen** (77%).

- **Increased collection and recycling of metals from technological waste would meet 57% of the demand for minerals** in the transition scenario in which current energy and digital transition policies are applied together with improved recycling systems.

- Demand for metals and the associated primary extraction can be reduced by applying **a combination of circular economy and sufficiency measures (extending the lifespan of technologies, increasing and accelerating recycling, limiting battery size in electric vehicles and promoting their reuse, and reducing the private vehicle fleet while increasing the number of buses).** These measures would achieve:

  + **An average 34% reduction in the demand for metals** and 50% reduction for key transition metals such as lithium;

  + Increased **contribution of recycled metals covering up to 67% of minerals demand;**

  + **Reduction in primary extraction requirements by an average of 49% for metals** as a whole, and up to 61% in the case of aluminium and 52% in the case of manganese.

- **Mobility-related measures have the greatest impact on reducing primary extraction.** Reducing the number of private vehicles on the road (by 2050, achieving a fleet of cars three times smaller than the current fleet) and promoting electric buses would reduce the need for primary extraction by 5%-35%, depending on the metal.

Chapter 5 examines **the consequences of primary extraction** associated with the analysed public policies in terms of their environmental impacts and from a global justice perspective. In terms of environmental impact, by applying circular economy and sufficiency measures, the contribution of primary extraction to energy consumption and CO_2 emissions in Spain could be reduced by up to 52%.

At the same time, minerals demand associated with the energy and digital transition **far exceeds Spain's equitable share of resources for some metals, with consumption of cobalt at almost double our quota. In the case of other metals such as lithium, our consumption almost reaches our quota.** Moreover, in the case of a transition scenario with no improvement in current recycling rates, the figures are much worse, but they can be improved applying the savings measures indicated above. These figures do not take into account minerals demand from other sectors of the economy, which would considerably increase the demand for certain metals.

Main recommendations

Chapter 6 concludes this study by summarising the main conclusions and recommendations for public authorities. In light of the data and analysis presented here, Amigas de la Tierra proposes the following **recommendations:**

- **Address the necessary change in the mobility model in Spain, with a view to drastically reducing the number of private vehicles on the road** and promoting public transport. In relation to electric cars, simultaneously establish a limit on battery size.
- **Extend the lifespan of wind and photovoltaic technologies, together with electric cars.**
- **Boost urban mining industry in Spain,** so that collection and recycling rates reach a level that allows secondary metals to contribute 57% of demand between 2020 and 2050.
- **Address the minerals supply discussion and planning from a global justice perspective** in order to avoid replicating current international inequalities.
- **Ensure the effective participation of local communities potentially affected by mineral policies and primary extraction projects (both inside and outside Europe) in all planning and decision-making processes.**
- **When planning the management and end use of mineral raw materials for the energy transition, prioritise collective models such as energy communities. These models guarantee energy sovereignty,** as well as the knowledge and energy literacy of the population and, thereby, efficient consumption.
- **Endorse the status of non-registrable land for all Natura 2000 network sites and other areas that have been deemed worthy of protection** which are incompatible with extractive activities, including, but not limited to, fluvial reserves and their associated basins and the protection perimeters of water extraction points for urban supply.

We also call on the Spanish Government to adopt **the following measures aimed at moving towards a production and consumption model that respects people and the planet:**

- Establish objectives and measures aimed at an absolute reduction in the consumption of mineral resources and the material footprint. In the same line, push for the adoption of a EU binding target to reduce the material footprint by 65% by 2050.
- Design post-growth policies to scale back economic sectors that are environmentally destructive while providing little or no social benefit, and to maintain or expand sectors that meet basic needs and promote well-being for all.
- Promote a circular economy model that includes the design of long-lasting infrastructures and products that comply with the principles of “sufficiency and efficiency”.
- Guarantee that all companies, specially those involved in the extraction and processing of raw materials, respect human rights and are accountable for their actions wherever they operate. Moreover, recognise communities´ right to say no to mining projects.
- Put an end to economic and resource exploitation in the Global South by halting trade and investment agreements that undermine government action to protect human rights and the environment, such as the EU-Mercosur agreement.

1. **The mine, the factory, the store. Global dynamics in the "green transition and their consequences in the "Lithium triangle",** Observatori del Deute en la Globalització, July 2023. https://odg.cat/wp-content/uploads/2023/07/The-mine-the-factory-the-store.pdf
2. **“Blood on the Green Deal. How the EU is boosting the mining and defense industries the name of climate action”**, November 2023. https://corporateeurope.org/en/2023/11/blood-green-deal
3. **“A Turning Point: The Critical Raw Material Act’s needs for a Social and Just Green Transition”,** Raw Materials Coalition. https://eurmc.org/publication/a-turning-point-the-criticalraw-material-acts-needs-fora-social-and-just-green-transition/

“We are a non-profit environmental organisation whose mission is to promote local and global change in favour of a society that respects the environment and is based on fairness and solidarity. We are a group of people who defend social and environmental justice; we firmly believe that politics should be centred on people and the Earth. We therefore denounce and put pressure on companies and governments, while at the same time proposing various solutions to bring about a fairer world"

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